REMARKS/ARGUMENTS

Favorable reconsideration of this application in view of the amendments and following remarks is respectfully requested.

Claims 1-3 and 13-16 are pending in this application. By this amendment, Claims 1, 3, and 13-16 are amended; and no claims are canceled or added herewith. It is respectfully submitted that no new matter is added by this amendment.

In the outstanding Office Action, Claim 1 is rejected on the grounds of non-statutory obviousness-type double patenting; Claims 1-3 and 13-16 were rejected under 35 U.S.C. § 112, second paragraph; and Claims 1-3 and 13-16 were rejected under 35 U.S.C. § 102(b) as anticipated by JP 05-109865 to Kono.

With respect to the double patenting rejection over co-pending application 10/706,915, Claim 1 is amended by the present amendment and is patentably distinct from Claim 1 of 10/706,915. Accordingly, withdrawal of the double patenting rejection is respectfully requested.

With respect to the § 112 rejection, the claims are amended herewith to clarify the features recited therein. Accordingly, withdrawal of the rejection under § 112 is respectfully requested.

It is respectfully submitted that the applied art does not teach or suggest that when the door member closes the first opening to open or close the access opening and the first opening from an inside of said chamber, a first gap is formed between the wall of the chamber and an outer periphery portion of the door member which portion is larger than the outer periphery of the first opening, wherein in the first gap, a flow rate of gas flowing from an inside of the chamber to an outside of the chamber through the first gap is substantially equal to a flow rate of gas flowing out from a second gap formed between the clean box and an outer surface of the wall of the chamber, as claimed in Claim 1.

In contrast, Kono (a copy of which is provided with this Amendment for the Examiner's convenience) discusses in lines 41 to 45 of column 1 (paragraph [0003]) that a seal member 13 seals a gap between an opening 11 of the POD10 and a pod door 21. A seal member 14 seals a gap between a flange 12 of the POD10 and a port plate 3. The seal member 15 seals a gap between a port plate 3 and a port door 31. Lines 32 to 38 of column 2 of Kono (paragraph [0009]) discusses that the pod 10 is transported from the other portion and is set on the port plate 3. The inside of the chamber is kept by a clean air. In this condition, the seal member 13 seals between the opening 11 of the POD 10 and pod door 21. The seal member 14 seals between a flange 12 of the POD10 and a port plate 3. The seal member 15 seals a gap between a port plate 3 and a port door 31.

Furthermore, line 48 of column 2 to line 17 of column 3 of Kono (paragraph [0009]) discusses that when the POD 10 is set on the port plate 3, nitrogen gas is flowed into the space A through gas inlet port 3A by opening the inlet side valve V1 connected to the nitrogen gas container and the exhaust valve V2 so that dust adhered on the surfaces exposed to the outside atmosphere of the port doors 21 and 31 is blown away. Accordingly, as above, if the space A is connected to the inside of the POD 10 by moving down the pod doors 21 and 31 together, the nitrogen gas delivered through gas inlet port 3A from the inlet side valve V1 is flowed into the POD 10 so that air in POD 10 is discharge to the outside of the apparatus to fully charge the POD 10 with nitrogen gas. If the up-down rod 32 moves down, because the flange portion 31A of the port door 31 detaches from the lower surface of the port plate 3, the space A is connected to not only the POD 10 but also the inside of the main body case 1. Therefore, in order to prevent air in POD 10 from flowing into the main body case 1, the bellows 50 is provided.

Accordingly, Kono discloses that all gaps are sealed with the seal members 13 to 15 when the port doors 21 and 31 are closed, while the gap between the flange portion 31A of

the port door 31 and the lower surface of the port plate 3 allows a gas flow when the port doors 2 and 31 are opened. As such, Kono fails to disclose the claimed feature that when the door member closes the first opening to open or close the access opening and the first opening from an inside of the chamber, a first gap is formed between the wall of the chamber and an outer periphery portion of said door member which portion is larger than the outer periphery of said first opening. And further that in the first gap, a flow rate of gas flowing from an inside of the chamber to an outside of the chamber through the first gap is substantially equal to a flow rate of gas flowing out from a second gap formed between the clean box and an outer surface of the wall of the chamber. The features of Claim 1 are not anticipated by Kono. Accordingly, withdrawal of the rejection under 102(b) is respectfully requested.

Consequently, for the reasons discussed in detail above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

Respectfully submitted,

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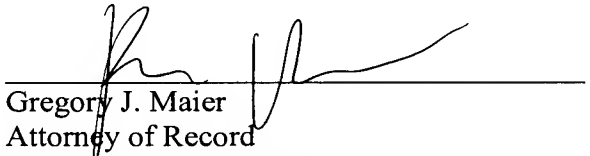

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Japanese Language Translation of JP appln. Laid-open No.5-109865

(57) [Abstract]

[Object] It is an object to provide an airtight container with high reliability capable of always ensuring sufficient airtightness without being influenced by a seal member.

[Constitution] A portable airtight container comprises a pod 10 having housing space and a pod door 21 for airtightly closing an opening 11 of the pod, and a seal engagement portion 110 of the pod engaged with a seal member 13 of the pod door 21 is formed of inner and outer edge-shaped protrusions 111A and 111B forming groove space 112 and surrounding the opening 11.

[Scope of Claims]

[Claim 1] A portable airtight container comprising a pod having housing space and a pod door for airtightly closing an opening of the pod, wherein a seal engagement portion of the pod engaged with a seal member of the pod door is formed of inner and outer edge-shaped protrusions forming groove space and surrounding the opening.

[Claim 2] The portable airtight container according to claim 1, wherein the groove space is partitioned by an edge-shaped partition at every predetermined interval in the longitudinal direction.

[Detailed Description of the Invention]

[0001]

[Industrial Applicability] The present invention relates to a portable airtight container.

[0002]

[Conventional Art] Conventionally, processing of a semiconductor is performed within a clean room which is specially designed for preventing particle pollution of the semiconductor. However, there is a problem that the processing requires expensive cost including maintenance thereof and further there is a limit in lowering of a pollution level of the particle pollution. Therefore, a standardized mechanical interface device for example as disclosed in Japanese Patent Application Laid-Open No. S60-14623 has been developed.

[0003] As shown in Fig. 6 for example, the device houses a wafer processing device (not shown) and includes a main body case 1 of the device which is filled with the cleaned air, a portable airtight container (hereinafter, referred to as the pod) 10 and a conveying device 30. In a top sheet 2 of the main body case 1 of the main

body of the device, a port (an inlet and outlet port of a wafer cassette 20) 4 is formed by a port plate 3, and the pod 10 having a holding portion 10A is mounted on the port plate 3. The pod 10 is formed so as to have a flange 12 provided with a circular portion around an opening 11 thereof. The conveying device 30 of the present example is a lifting/lowering device for lifting/lowering the wafer cassette 20 which is mounted on a lifting/lowering base 31 supported by a lifting/lowering axis 32. The lifting/lowering base 31 is formed in a port door, and at the time of lifting to the highest position, brought in abutment with or fitted to the port plate 3 from the lower side so as to seal the port 4 and the main body case 1 from the outside. Alternatively, a base 21 of the wafer cassette 20 on the port door 31 is brought in abutment with a peripheral portion of the opening 11 of the pod 10 so as to seal the opening 11. Hereinafter, the base 21 is referred to as the pod door. The reference numeral 13 denotes a seal member for sealing between the opening 11 of the pod 10 and the pod door 21. A seal member 14 seals between the flange 12 of the pod 10 and the port plate 3, and a seal member 15 seals between the port plate 3 and the port door 31. The reference numeral 40 denotes a locking mechanism having a locking lever 41 driven by a geared motor (not shown), for pushing the flange 12 of the pod 10 down to the port plate 3.

[0004] Conventionally, the particle pollution of a wafer W is a problem. As a semiconductor integrated circuit is increasingly highly densified, an influence of a natural oxidation film on a surface of the wafer due to oxygen in the air starts to be a problem. In order to prevent growth of the natural oxidation film, there is a need for moving and conveying the wafer W in an inert gas (N_2

gas) atmosphere. At the present, the N_2 gas atmosphere with O_2 and H_2O concentration of 10 ppm or less is required.

[0005] In the case where the device mentioned above is used, the air in the main body case 1 is replaced with the N_2 gas so as to make the N_2 gas atmosphere, and every time when the pod 10 is set on the top sheet 2 of the main body case 1, the inside thereof is replaced with the N_2 gas so as to make the N_2 gas atmosphere. Therefore, there is a need for ensuring sufficient airtightness for the pod 10.

[0006] Fig. 7 shows an example of the mechanical interface device provided with the above gas replacing function. The pod door 21 houses fixing means as shown in Fig. 8 for example, and is conveyed from the device to another device with the pod 10.

[0007] In Fig. 8, the pod door 21 is a hollow frame body. The reference numeral 61 denotes a cum, and a cum axis (not shown) is extended to the inside of the port door 31 and driven by a motor (not shown) housed in the port door 31. The reference numeral 62 denotes a plate-like locking arm having a rolling element 62a and being supported and cantilevered so as to move and incline in the longitudinal direction. The reference numeral 63 denotes a supporting point member, and the reference numeral 64 denotes a spring. The reference numeral 10B denotes a fitting concave portion formed on an inner peripheral surface of the flange 12 of the pod 10.

[0008] In the above constitution, the cum 61 has a specific cum surface. When the cum 61 is rotated, the locking arm 62 is displaced in the arrow direction in the figure towards the engaging concave portion 10B, and a tip portion thereof is engaged with the fitting

concave portion 10B.

[0009] Provided that the pod 10 is moved from the other place onto the port plate 3 and the inside is cleaned air atmosphere. In the above state, the seal member 13 seals between the opening 11 of the pod 10 and the pod door 21, the seal member 14 seals between the flange 12 of the pod 10 and the port plate 3, and the seal member 15 seals between the port plate 3 and the port door 31. At this time, the locking arm 62 is engaged with the engaging concave portion 10B, and inclines and presses the pod 10 to the port plate 3 so as to ensure a sealing property between the flange 12 and the port plate 3. When the inside of the pod 10 is replaced with the N_2 gas, the lock by the locking arm 62 is released, the lifting/lowering axis 32 is slightly lowered and the pod door 21 is brought apart from an opening surface of the pod 10 so that space (space between the port 4 and a periphery side surface of the port door 31) A to which a gas-supply port 3A and a gas-discharge port 3B are opened is communicated with the inside of the pod 10. Actually, when the pod 10 is placed on the port plate 3, a gas-charge valve V1 and an air-discharge valve V2 connected to a N_2 gas tank are opened, the N_2 gas is charged into the space A from the gas-charge port 3A, dust or the like which is adhered to a surface of the pod door 21 and the port door 31 exposed to the outside air is discharged from the gas-discharge port 3B to the outside of the device. Therefore, as in the above, when the pod door 21 is lowered integrally with the port door 31 and the space A is communicated with the inside of the pod 10, the N_2 gas fed from the gas-charge valve V1 through the gas-charge port 3A intrudes into the pod 10 and discharges the air in the pod 10 from the gas-discharge port 3B to the outside

of the device so that the inside of the pod 10 becomes the N_2 gas. As in the above, when the lifting/lowering axis 32 is lowered, a flange portion 31A of the port door 31 is brought apart from a lower surface of the port plate 3. Therefore, the space A is not only communicated with the inside of the pod 10 but also with the inside of the main body case 1 (which is already the N_2 gas atmosphere) and hence there is a risk that the air in the pod 10 intrudes into the main body case 1. Consequently, in the present example, bellows 50 are provided in order to prevent the above.

[0010]

[Problems to be Solved by the Invention] In the conventional example, the seal member 13 is made of single pore sponge rubber, the engagement portion engaged with the seal member 13 of the pod 10 is an edge-shaped portion 110 protruding towards the seal member 13 as enlarged and shown in Fig. 9, and the seal member 13 deeply bites the edge-shaped portion as shown in Fig. 10 so as to ensure a favorable sealing property between the pod 10 and the pod door 21.

[0011] However, the seal member 13 which is made of the sponge-like rubber is not always perfect. For example, as shown in Fig. 11(A), in the case where there is a twist or unevenness in thickness, a seal defect portion P is created and due to a chip 110a of the seal engagement portion 110 as shown in Fig. 11(B), the seal defect portion P is also created. When such a seal defect portion P is created, the inside of the pod 10 is communicated with the outside through the seal defect portion P so as to lower the sealing property.

[0012] The present invention is achieved in order to solve the above problem, and an object thereof is to provide an airtight container with high reliability capable of always ensuring

sufficient airtightness without being influenced by a seal member.

[0013]

[Means for Solving the Problems] In order to solve the above object, in the present invention, claim 1 is a portable airtight container comprising a pod having housing space and a pod door for airtightly closing an opening of the pod, in which a seal engagement portion of the pod engaged with a seal member of the pod door is formed of inner and outer edge-shaped protrusions forming groove space and surrounding the opening.

[0014] In claim 2, the groove space is partitioned by an edge-shaped partition at every predetermined interval in the longitudinal direction.

[0015]

[Operation] Since the seal member engagement portion of the present invention is formed of the inner and outer edge-shaped protrusions forming the groove space and surrounding the opening, an inner seal portion and an outer seal portion are created so as to have a double seal structure.

[0016]

[Embodiments] Hereinafter, a description will be given to an embodiment of the present invention with reference to the drawings.

[0017] Fig. 1 shows an opening 11 and a flange 12 of a pod 10. A seal member engagement portion 110 is formed of edge-shaped protrusions 111A and 111B partitioning groove space 112 and surrounding the opening as shown in Fig. 2.

[0018] The present embodiment is provided with a double seal structure of an inner seal portion of the protrusion 111A and an outer seal portion of the protrusion 111B. Therefore, even when

there is a seal defect portion P, it is highly possible that any of the seal portions can ensure a sealing property, and hence reliability is improved in comparison with the conventional seal structure.

[0019] Fig. 3 shows a second embodiment which is different from the embodiment of Fig. 1 in that the groove 112 is partitioned by a partition 111C at every predetermined interval in the longitudinal direction as shown in Figs. 4 and 5.

[0020] In the seal structure of Fig. 1, when the seal defect portion P is created, N_2 gas in the pod 10 is leaked to the groove space and flows through the groove space. Therefore, in the case where another seal defect portion P is created, the inside of the pod 10 is communicated with the outside through the route shown in Fig. 1. However, in the present embodiment, the above communication is blocked by the partition 111C. In comparison with the embodiment of Fig. 1, the sealing property is more improved and further the reliability is improved.

[0021]

[Effect of the Invention] As mentioned above, in the present invention, the two inner and outer seal portions are provided and it is highly unlikely that sealing functions of both the seal portions are lowered at the same time. Therefore, it is possible to always ensure sufficient airtightness without being influenced by the seal member and to improve the reliability in comparison with the conventional example.

[Brief Description of the Drawings]

[Fig. 1] Fig. 1 is a partial view of the opening side of a pod showing an embodiment of the present invention.

[Fig. 2] Fig. 2 is an arrow view by line A-A in the above embodiment.

[Fig. 3] Fig. 3 is a partial view of the opening side of a pod showing a second embodiment of the present invention.

[Fig. 4] Fig. 4 is an arrow view by line B-B in the second embodiment.

[Fig. 5] Fig. 5 is an arrow view by line C-C in the second embodiment.

[Fig. 6] Fig. 6 is a schematic view showing an example of a conventional SMIF device.

[Fig. 7] Fig. 7 is a schematic view showing another example of the conventional SMIF device.

[Fig. 8] Fig. 8 is a vertically sectional view of a pod door in the conventional example of Fig. 7.

[Fig. 9] Fig. 9 is an enlarged view of a seal engagement portion in the conventional example of Fig. 7.

[Fig. 10] Fig. 10 is a view showing a sealing state in the conventional example of Fig. 7.

[Fig. 11] Fig. 11 is a view for explaining a problem in the conventional example of Fig. 7.

[Explanation of the Reference Numerals]

1: Main body case

3: Port plate

4: Port

10: Pod

10B: Fitting concave portion

11: Opening of pod

12: Flange of pod

13: Seal member

20: Wafer cassette

21: Pod door

31: Port door

31A: Flange of port door

31D: Protrusion

32: Lifting/lowering axis

110: Seal engagement portion

111A: Inner edge-shaped protrusion

111B: Outer edge-shaped protrusion

111C: Partition

112: Groove space